 INTERCOM

Provide
a modern
messaging
experience.

[Start your free trial](#)

Eclipse Memory Analyzer (MAT) - Tutorial

Lars Vogel (c) 2009, 2016 vogella GmbH – Version 1.3, 06.07.2016

Table of Contents

1. Analyzing memory leaks with Eclipse
 - 1.1. The Eclipse Memory Analyser (MAT) tooling
 - 1.2. Using heap dumps to get a snapshot of the memory of an application
2. Installation
3. Creating heap dumps for Java programs
4. Use the Eclipse Memory Analyzer
 - 4.1. Reviewing a heap dump
 - 4.2. Analyzing Android heap dumps with Eclipse
5. Example
 - 5.1. Create Project
 - 5.2. Create heap dump and analysis
6. jconsole
7. About this website
8. Links and Literature
 - 8.1. MAT Resources
 - 8.2. vogella GmbH training and consulting support
- Appendix A: Copyright and License

This article describes the usage of the Eclipse Memory Analyzer (MAT) to identify memory leaks.

Download

Free Download [Go to unzipper.com](#)



1. Analyzing memory leaks with Eclipse

1.1. The Eclipse Memory Analyser (MAT) tooling

The *Eclipse Memory Analyser Tooling* (MAT) is a set of plug-ins for the Eclipse IDE which provides tools to analyze heap dumps from Java application and to identify memory problems in the application. This helps the developer to find memory leaks and high memory consumption issues.

It visualizes the references to objects based on Java *heap dumps* and provides tools to identify potential memory leaks.

1.2. Using heap dumps to get a snapshot of the memory of an application

Millions of
developers:
one call.



The world's
leading
developer
advertising
group

A *heap dump* is a snapshot of the complete Java object graph on a Java application at a certain point in time. It is stored in a binary format called HPROF.

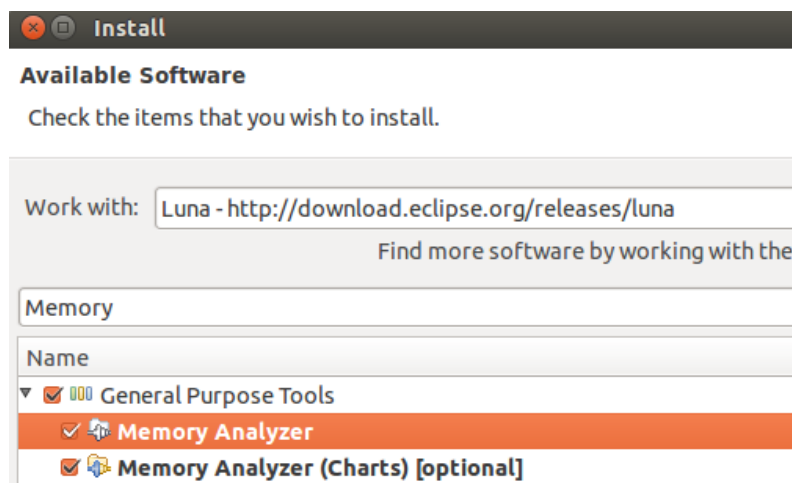
It includes all objects, fields, primitive types and object references.



Millions of developers: one call.
The world's leading developer advertising group

2. Installation

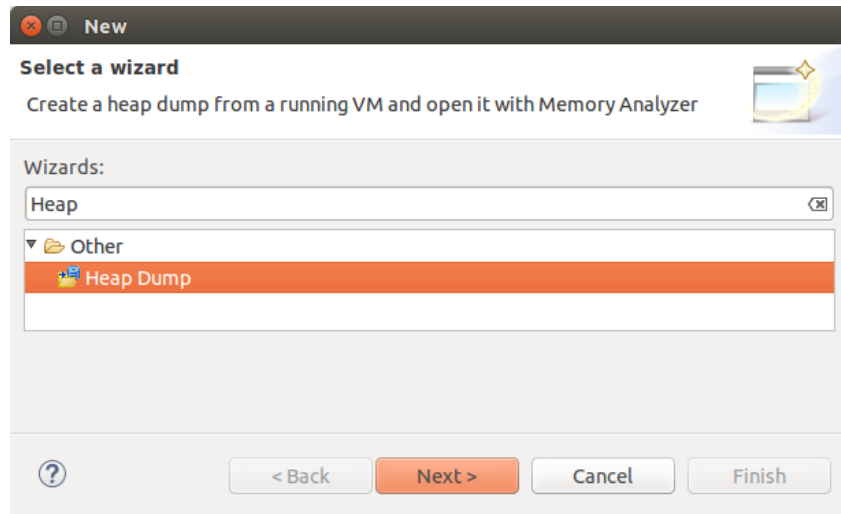
Install Eclipse MAT via the Help ► Install New Software... menu entry. Select the update site of your release from the drop-down box and once its content is downloaded, select *General Purpose Tools* and its sub-entries *Memory Analyzer* and *Memory Analyzer(Charts)*.



3. Creating heap dumps for Java programs

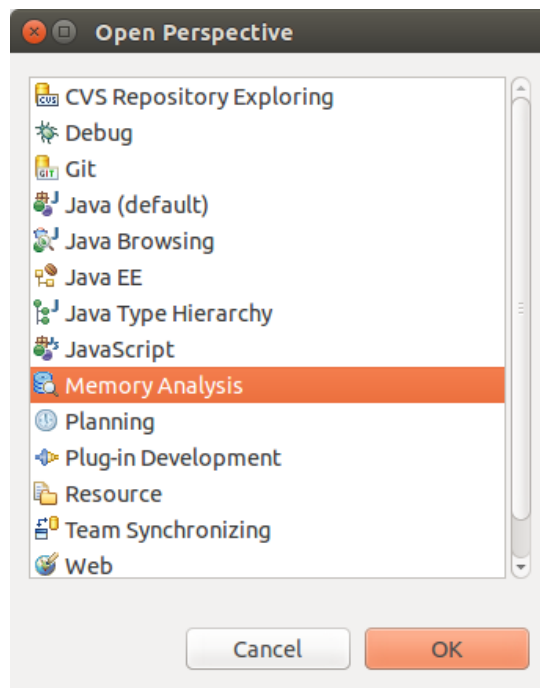
It is possible to instruct the JVM to create automatically a *heap dump* in case that it runs out of memory, i.e. in case of a `OutOfMemoryError` error. To instruct the JVM to create a *heap dump* in such a situation, start your Java application with the - `XX:+HeapDumpOnOutOfMemoryError` option.

Use the File ► New ► Other... ► Other ► Heap Dump menu entry to open a dialog to select for which process you want to acquire a memory dump.



Select the process for a heap dump in the following dialog and press the **Finish** button.

Alternatively you can also interactively create a heap dump via Eclipse. For this, open the *Memory Analysis* perspective via **Perspective ▸ Open Perspective ▸ Other...**



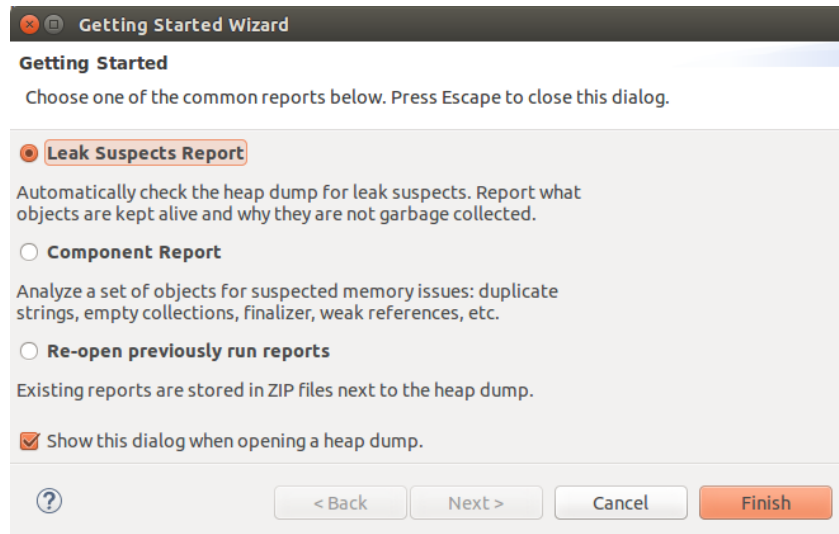
If you trigger the creation of the heap manually the JVM performs a garbage collector run before it writes the heap dump.

4. Use the Eclipse Memory Analyzer

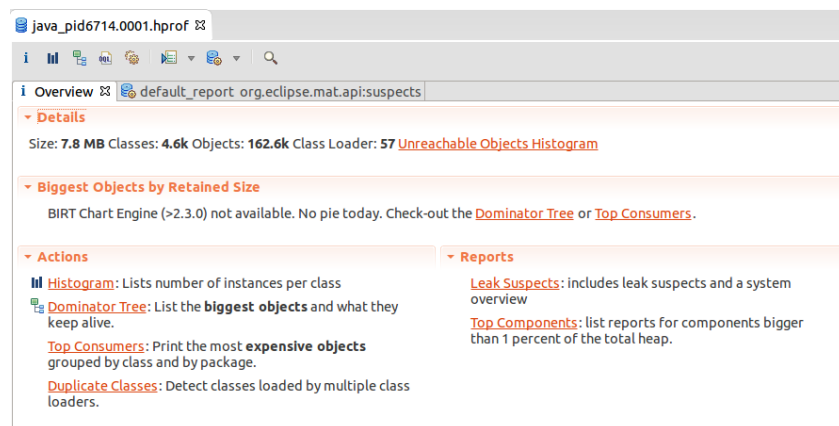
4.1. Reviewing a heap dump

After a new *heap dump* with the *.hprof* ending has been created, you can open it via a double-click in Eclipse. If you used MAT to create the heap dump, it should be opened automatically.

You may need to refresh your project (F5 on the project). Double-click the file and select the *Leak Suspects Report*.



The overview page allows you to start the analysis of the heap dump. The *dominator tree* gives quickly an overview of the used objects.



In the dominator tree you see the references which are hold.

| Class Name | Shallow Heap |
|--|--------------|
| <Regex> | <Numeric> |
| class org.eclipse.ui.IViewPart @ 0x7adce11f0 | 0 |
| [586] java.lang.Object[1280] @ 0x7adf9c110 | 5,136 |
| elementData java.util.Vector @ 0x7b0fa1550 | 32 |

To find which element is holding the reference to this object, select the entry and select *Find shortest path to GC root* from the context menu.

4.2. Analyzing Android heap dumps with Eclipse

Android allows to create heap dumps of an application's heap. This heap dump is stored in a binary format called HPROF. To create a heap dump use the `Dump HPROF file` button in the *DDMS Perspective*.

The Android heap dump format is similar to the Java heap dump format but not exactly the same. Eclipse MAT can work directly with the Android heap dump format.

5. Example

5.1. Create Project

Create the Java project called `com.vogella.mat.first` and the `com.vogella.mat.first` package. Create the following class.

```
package com.vogella.mat.first;

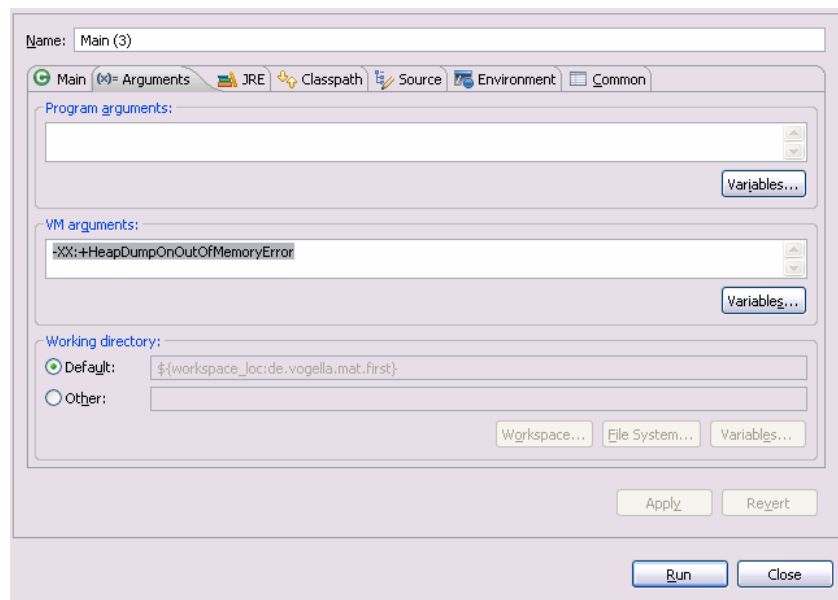
import java.util.ArrayList;
import java.util.List;

public class Main {

    /**
     * @param args
     */
    public static void main(String[] args) {
        List<String> list = new ArrayList<String>();
        while (1<2){
            list.add("OutOfMemoryError soon");
        }
    }
}
```

5.2. Create heap dump and analysis

In Eclipse add the `-XX:+HeapDumpOnOutOfMemoryError` to the runtime configuration.



Run the project. It crashes and writes an heap dump.



[Tutorials](http://www.vogella.com/tutorials/) (<http://www.vogella.com/tutorials/>) [Training](http://www.vogella.com/training/) (<http://www.vogella.com/training/>) [Consulting](http://www.vogella.com/consulting/) (<http://www.vogella.com/consulting/>) [Products](http://www.vogella.com/products/) (<http://www.vogella.com/products/>) [Books](http://www.vogella.com/books/) (<http://www.vogella.com/books/>) [Company](http://www.vogella.com/company/) (<http://www.vogella.com/company/>)

[Donate](http://www.vogella.com/support.html) (<http://www.vogella.com/support.html>) [Contact us](http://www.vogella.com/contact.html) (<http://www.vogella.com/contact.html>)

6. jconsole

You can also interactively create a *heap dumps* via the *jconsole*, a tool which is included in the JDK. Type *jconsole* in the command line to start it.



NOW Hiring
(<http://www.vogella.com>)

QUICK LINKS

- [06 FEB - RCF Training](#)
(<http://www.vogella.com>)
- [20 FEB - And](#)

To allow a Java program the access of jconsole use the -Dcom.sun.management.jmxremote start option.

Use them MBeans | com.sun.management | HotSpotDiagnostics | Operations | DumpHeap .

More info can be found in [JConsole](#)

(<http://java.sun.com/developer/technicalArticles/J2SE/jconsole.html>) and

[JConsole Tutorial](#)

(<http://java.sun.com/j2se/1.5.0/docs/guide/management/jconsole.html>).



[Development](#)

(<http://www.vog>

• [vogella Traini](#)

(<http://www.vog>

• [vogella Books](#)

(<http://www.vog>

SHARE



Download

Free Download

www.unzipper.com



7. About this website

| | | | |
|--|--|---|---|
| <p>Support free content</p> <p>(http://www.vogella.com)</p> | <p>Questions and discussion</p> <p>(http://www.vogella.com)</p> | <p>Tutorial & code license</p> <p>(http://www.vogella.com)</p> | <p>Get source code</p> <p>(http://www.vogella.com/code/index.html)</p> |
|--|--|---|---|

8. Links and Literature

8.1. MAT Resources

How to acquire a Heap Dump from MAT

(<http://community.bonitasoft.com/blog/acquire-heap-dump-mat-memory-analyzer-tool>)

8.2. vogella GmbH training and consulting support

| <u>TRAINING</u> | <u>SERVICE & SUPPORT</u> |
|---|---|
| (http://www.vogella.com/training/) | (http://www.vogella.com/consulting/) |



[Tutorials](http://www.vogella.com/tutorials/) (<http://www.vogella.com/tutorials/>) [Training](http://www.vogella.com/training/) (<http://www.vogella.com/training/>) [Consulting](http://www.vogella.com/consulting/) (<http://www.vogella.com/consulting/>) Search

(<http://www.vogella.com>)

[Products](http://www.vogella.com/products/) (<http://www.vogella.com/products/>) [Books](http://www.vogella.com/books/) (<http://www.vogella.com/books/>) [Company](http://www.vogella.com/company/) (<http://www.vogella.com/company/>)

[Donate](http://www.vogella.com/support.html) (<http://www.vogella.com/support.html>) [Contact us](http://www.vogella.com/contact.html) (<http://www.vogella.com/contact.html>)

NOW Hiring
(<http://www.vogella.com>)

QUICK LINKS

- [06 FEB - RCF Training](#)
(<http://www.vog>
- [20 FEB - And](#)

The vogella company provides comprehensive [training and education services](http://www.vogella.com/training/) (<http://www.vogella.com/training/>) from experts in the areas of Eclipse RCP, Android, Git, Java, Gradle and Spring. We offer both public and inhouse training. Whichever course you decide to take, you are guaranteed to experience what many before you refer to as [“The best IT class I have ever attended”](http://www.vogella.com/training/) (<http://www.vogella.com/training/>).

The vogella company offers [expert consulting](http://www.vogella.com/consulting/) (<http://www.vogella.com/consulting/>) services, development support and coaching. Our customers range from Fortune 100 corporations to individual developers.

[Development](http://www.vogella.com/development/)

(<http://www.vogella.com/development/>)

- [vogella Training](http://www.vogella.com/training/) (<http://www.vogella.com/training/>)
- [vogella Books](http://www.vogella.com/books/) (<http://www.vogella.com/books/>)

SHARE



Millions of developers: one call.
The world's leading developer advertising group

Appendix A: Copyright and License

Copyright © 2012-2016 vogella GmbH. Free use of the software examples is granted under the terms of the EPL License. This tutorial is published under the [Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Germany](http://creativecommons.org/licenses/by-nc-sa/3.0/de/deed.en) (<http://creativecommons.org/licenses/by-nc-sa/3.0/de/deed.en>) license.

See [Licence](http://www.vogella.com/license.html) (<http://www.vogella.com/license.html>).

Version 1.3

Last updated 2016-09-14 13:39:11 +02:00



[Tutorials](http://www.vogella.com/tutorials/) (<http://www.vogella.com/tutorials/>) [Training](http://www.vogella.com/training/) (<http://www.vogella.com/training/>) [Consulting](http://www.vogella.com/consulting/) (<http://www.vogella.com/consulting/>) [Products](http://www.vogella.com/products/) (<http://www.vogella.com/products/>) [Books](http://www.vogella.com/books/) (<http://www.vogella.com/books/>) [Company](http://www.vogella.com/company/) (<http://www.vogella.com/company/>) [Donate](http://www.vogella.com/support.html) (<http://www.vogella.com/support.html>) [Contact us](http://www.vogella.com/contact.html) (<http://www.vogella.com/contact.html>)



NOW Hiring!
(<http://www.vogella.com/jobs/>)

QUICK LINKS

- [06 FEB - RCF Training](http://www.vogella.com/06-feb-rcf-training/) (<http://www.vogella.com/06-feb-rcf-training/>)
- [20 FEB - And](http://www.vogella.com/20-feb-and/)